

# **The Quiet Invasion: Legal and Policy Responses to Aquatic Invasive Species in North America**

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## **ABSTRACT**

Invasive species are a serious threat to biological diversity and cause economic losses to such industries as agriculture, aquaculture, and forestry. The magnitude of the aquatic invasive species problem has increased exponentially with the expansion of world trade. In response, there have been some efforts made internationally and domestically to prevent, eradicate and control aquatic invasive species in recent years. This article provides an overview of those efforts. It is becoming clear, however, that the response to date has been inadequate, and much remains to be done. New pathways and new invasions are still being discovered, often at a stage when invaders have become well established, thereby making prevention, eradication and control very expensive and difficult to achieve. This study provides a survey of legal tools available to address aquatic invasive species, and suggests possible responses.

## **Introduction**

While the economic, social, cultural, and ethical implications of global trade are being debated, and the rate of global trade is escalating, a serious ecological and economic threat resulting from the movement of goods has evolved from theory into reality, from a small scale problem a few decades ago, to a serious threat today. The threat is that of invasive species, of the introduction of alien species into ecosystems unprepared to control or accommodate them.<sup>1</sup> Invasive species are generally considered to be the second most serious threat to biodiversity, next to habitat loss. As is discussed below, transportation of goods is not the only cause of invasions, but it is a major source. In the context of aquatic invasives,

<sup>1</sup> For a general overview of the threat of invasives, see “Invasive Species, Comprehensive Review on the Efficiency and Efficacy of Existing Measures for their Prevention, Early Detection, Eradication, and Control”, Annex, at: UNEP/CBD/SBSTTA/6/7, available at: <http://www.biodiv.org/doc/meeting.asp?wg=SBSTTA-06> (last visited 4 October 2002).

introductions result from vessels carrying species from one ecosystem to another, and from other sources such as certain fishing practices and aquaculture.

One of the many challenges in responding to the invasive species threat is that scientists are not able to predict which species will thrive in which introduced ecosystem, and what impact an invader will have once introduced. The problem is amplified by the fact that it has proven extremely difficult to undo the damage done once an invasive species has successfully invaded a foreign ecosystem. In fact, in most cases to date, the struggle over control of the invading population, let alone eradication, has been a losing battle. It is generally accepted that by far the most effective method of safeguarding against invasions has been to prevent them. Assuming that the activity that leads to the introduction has significant value to society, it is reasonable to expect that measures proposed to prevent the reduction will generally not include the option of eliminating the activity itself. The initial focus will be on measures to prevent the reduction while allowing the activity to continue as unaffected as possible.

Such measures to prevent introductions have resulted in some reductions in the risk in specific instances, but have been far from preventing new introductions. At the same time activities leading to introductions are increasing exponentially. The result has been ecologically and economically devastating invasions at increasing rates and billions of dollars spend on trying to control or eradicate invasions. It has also become clear that invasions are no longer isolated incidents. In Australia, for example, a 1997 report identified over 140 introduced species that either had or threatened to establish themselves in Australian waters to the point of being considered invasive.<sup>2</sup> The number of species identified had doubled within a period of two years from about 70 to over 140 marine species of concern.

There is little doubt from the scientific work done on this issue that the problem of invasions is of growing ecological concern. At the same time, the activities that lead to invasions (and sometimes the introduced species themselves) are associated with considerable human benefits. We rely on introduced species for agriculture, forestry, gardening, in fish tanks, and aquaculture, to name a few. We would find it hard to imagine life without international transport of people and goods, or without the use of non-native species for agriculture and forestry.

In considering the nature of a response to this threat, it is therefore crucial to consider the cost associated with invasions as a starting point in understanding the choices we face in addressing this challenge. One challenge here as with many environmental issues is that the benefits of the status quo are generally readily identifiable in economic terms, whereas the cost of the status quo and the corresponding benefits of addressing the problem are understood in qualitative

<sup>2</sup> Dianne Furlani, *A Bibliography of the Introduced Marine Species in Australian Waters* (Centre for Research on Introduced Marine Pests (CRIMP), November 1997).

terms, making a direct comparison of costs and benefits of action or inaction difficult.

It is possible, however, to get a sense of the costs associated with the problem of invasive species. According to recent estimates, the annual loss attributed to alien invasive species in the US alone amounts to 137 billion dollars.<sup>3</sup> The study estimates the losses of similar magnitude in the United Kingdom at 12 billion, Brazil at 50 billion and India at 117 billion. Examples of invasions with drastic social and economic consequences, both terrestrial and water based, exist in almost every part of the world.<sup>4</sup> At the same time there is an almost complete absence of success stories in responding to the invasions.<sup>5</sup>

The stakes are high, both in terms of the value of the activities that result in the invasions and the value of the resources and activities threatened.<sup>6</sup> One of the crucial questions in developing appropriate law and policy responses to this issue will be whether in case of each pathway or activity there is room for co-existence, and if so how. A related challenge is how to evaluate the risk and cost of invasions on the one hand and the utility of the activity that leads to the invasions on the other.

With respect to vessels, invasions can result from ballast water exchange, hull fouling, and from species found in the goods being shipped themselves. Vessels inadvertently transport species through these pathways from their native habitats to ecosystems that are sometimes thousands of kilometres away. More often than not, the conditions in the receiving environment are not suitable for the species being introduced, and they do not survive for more than a few generations. In more and more cases, however, introduced species do find favourable conditions, and thrive in their new environment, fundamentally altering the ecosystem they invade. Given that a cubic metre of ballast water may contain 3,000 to 10,000 marine creatures, and billions of litres of ballast water are transported each day, very low percentages of successful invasions can result in significant numbers of introductions taking hold in the receiving waters. When this happens, invasive species displace native species, destroy fish stocks, and otherwise disrupt existing species and the industries that depend upon them. According to some estimates, on average one new introduced species is becoming established per day.<sup>7</sup>

<sup>3</sup> Charles Perrings, Mark Williamson, and Silvana Dalmazzone, *The Economics of Biological Invasions* (Cheltenham, UK: Edward Elgar, 2000).

<sup>4</sup> See S.M. Lowe, S. Browne, Boudjelas and M. DePoorter, *100 of the World's Worst Invasive Alien Species: A selection from the Global Invasive Species Database* (IUCN-ISSG, 2001).

<sup>5</sup> See C. Shine, N. Williams and L. Gruendling, "A Guide to Designing Legal and Institutional Frameworks on Alien Invasive Species", Environmental Policy and Law Paper No. 40 (IUCN Environmental Law Centre, 2000), pp. 8, 69.

<sup>6</sup> For a discussion of the impact of invasive species on major economic sectors, see GISP, "Global Strategy on Invasive Alien Species", 5 January 2001 (Draft). For more information on GISP see: <http://jasper.stanford.edu/gisp/> (last visited 19 March 2002).

<sup>7</sup> See J.M. Carlton and J.B. Geller, "Ecological Roulette: The Global Transport and Invasion of Non-indigenous Marine Organisms", (1993) *Science* 261, 78–82; National Research Council, *Stemming the Tide: Controlling Introductions of Non-indigenous Species by Ships' Ballast Water* (Washington DC, National Academy Press, 1996).

Aquatic invasive species do not travel by cargo vessel alone. Introductions result from a variety of human activities, including aquaculture, and a variety of fishing practices. Aquatic invasive species come in all shapes and sizes, ranging from Atlantic salmon escaping from aquaculture facilities on the Pacific coast to pathogens released through ballast water practices. With increasing economic activities resulting in these invasions, the stakes in terms of finding ways to address the problem without causing economic harm have become much higher. Only time will tell whether the risk of invasion from these various sources can be controlled without interfering substantially with the increase of these activities.

In response to the invasives problem, there have been some efforts made internationally and domestically to prevent, eradicate or control aquatic invasive species in recent years. It is becoming clear, however, that the response to date has been inadequate, and much remains to be done. New pathways and new invasions continue to be discovered, often at a stage when the invader has become well established, thereby making prevention, eradication and control very expensive and difficult to achieve.<sup>8</sup>

The purpose of this study is to review existing legal frameworks in Canada, the US and Mexico as well as international instruments and institutions dealing with this issue. The study provides a brief survey of legal tools that address aquatic invasive species, and suggests possible responses. The conclusion offers some thoughts on ways to reduce the risk of invasions in the short term, and raises some issues for further study, such as work on possible linkages to other issues, and on longer-term solutions.

## The Legal Framework

### International Context

There has been considerable international effort to address the issue of invasive species stretching over almost 20 years. During this time, the approach to invasives has evolved from a focus on specific pests and diseases that threaten human health or commercial plants and animals to a general recognition that biodiversity and nature conservation issues also need to be considered. To date, however, much of the international effort has been fragmented and short on results. Efforts to develop a more cohesive approach to invasives are still in the early stages. Initiatives to implement international law and policy responses in keeping with the long-term risk of inaction have been rare and unsuccessful to date. At the same time, there are over 40 binding and non-binding international agreements and other instruments that deal in some way with invasives. About

<sup>8</sup> For a more detailed discussion on prevention and control measures for invasive species, see: G. Preston, A.G. Brown and E. van Wyk (eds.), *Best Management Practices for Preventing and Controlling Invasive Alien Species* (Cape Town, South Africa: Working for Water Programme, Symposium Proceedings), ISBN 0-620-26172-2.

half of these instruments have implications for aquatic invasive species in the North American region. The lead international agencies involved in international efforts to address this issue are the United Nations Environment Programme (UNEP), the Food and Agriculture Organisation (FAO), the International Maritime Organisation (IMO) and the World Conservation Union (IUCN). The following are some highlights of what is currently in place internationally.

*United Nations Environment Programme (UNEP)*<sup>9</sup>

Under the UNEP umbrella, the problem of invasives has received considerable attention over the past few years. In Chapter 15 of Agenda 21,<sup>10</sup> the contribution of invasive species to loss of biodiversity is formally acknowledged. Chapter 17 provides for states to work individually and in co-operation to address the issue of aquatic invasives in the context of ballast water and aquaculture. Chapter 18 assigns responsibility for freshwater noxious species to individual states. These chapters of Agenda 21 are non-binding. Nevertheless, they built upon the initial acknowledgement of the invasive aquatic species issue under the United Nations Law of the Sea Convention (LOSC),<sup>11</sup> which was signed in 1982. Under Article 196 of the LOS states are required to take all measures necessary to prevent, reduce and control pollution of the marine environment resulting from the intentional or accidental introduction of species that may cause harm. The US and Canada have not ratified the LOSC. Mexico ratified the Convention in 1983.

Article 8(h) of the 1992 Convention on Biological Diversity (CBD)<sup>12</sup> includes a very general commitment by parties “as far as possible and as appropriate” to prevent the introduction of, control or eradicate alien species that threaten ecosystems, habitats or species. The Convention endorses the application of the precautionary approach to issues of biodiversity. In addition there are general requirements under the Convention that provide tools for addressing the invasives issue. They include integration of biodiversity into sectoral and cross-sectoral plans, programmes and policies, identification and monitoring processes, and a requirement to carry out environmental impact assessments for relevant projects, programmes and policies.<sup>13</sup>

In 1995, efforts of the parties with respect to invasives under the CBD led to the Jakarta Mandate on Marine and Coastal Biological Diversity.<sup>14</sup> It was

<sup>9</sup> See UNEP website: <http://www.unep.org/> (last visited 4 October 2002).

<sup>10</sup> See *Report of the United Nations Conference on Environment and Development: Vol. 1*, Agenda Item 21, p. 13, UN Doc. A/CONF.151/26/Rev.1 (1993).

<sup>11</sup> Convention on the Law of the Sea, UN Doc. A/Conf.62/122 of 10 December 1982, (1982) 21 ILM 1261. For a copy of LOSC (1982), see: <http://www.un.org/Depts/los/index.htm> (last visited 4 October 2002).

<sup>12</sup> Convention on Biological Diversity, 5 June 1992, EmuT 992:42, (1992) 31 ILM 818. For information on the CBD, see: <http://www.biodiv.org/> (last visited 4 October 2002).

<sup>13</sup> See Art. 6, Art. 7 (plus Annex I), and Art. 14 of the Convention respectively.

<sup>14</sup> For more information on the COP4 follow-up to the Jakarta Mandate, see: UNEP/CBD/COP/4/Decision IV/1, Part C, “Alien Species that Threaten Ecosystems, Habitats or Species”; for a copy, see: <http://www.biodiv.org/decisions/default.asp?lg=0&m=cop-04> (last visited 4 October 2002).

followed up at COP4 with a more detailed response, including the following three objectives that are relevant to the issue of invasive species:

- (1) to better understand the causes and impacts of introductions,
- (2) to identify gaps in legal instruments, and
- (3) to track incidents of invasions.<sup>15</sup>

The Jakarta Mandate further endorses a precautionary approach and prevention over eradication and control.<sup>16</sup>

In 2000, the Cartagena Protocol on Biosafety was opened for signature under the CBD. It includes provisions for advance informed agreement by the receiving country for living modified organisms for intentional introductions into the environment (Articles 7–10), as well as provisions for handling, transport, packaging and identification (Article 18).

The CBD Secretariat has taken the further step of developing interim Guiding Principles for the Prevention, Introduction and Mitigation of Impacts of Alien Species. These were presented to COP5 in May 2000.<sup>17</sup> While not formally endorsed, they do provide a preliminary indication of what international guiding principles and priorities might be adopted on this issue. They support a sequenced approach, with a focus on prevention, then eradication, and long-term control where eradication is not possible. These principles are to be further developed in time for COP6.<sup>18</sup> They include the following additional priorities: standardised terminology, criteria for assessing risk, and processes for assessing socio-economic and biodiversity impacts.

The Scientific Committee on Problems of the Environment (SCOPE) has co-ordinated, with the collaboration of the Centre for Agriculture and Biosciences International (CAP International), IUCN and UNEP, the Global Invasive Species Programme (GISP), which was established in 1997 to address global threats caused by invasive alien species and, among other things, to provide support to the implementation of Article 8(h) of the CBD. It has recently released a Global Strategy on Invasive Alien Species.<sup>19</sup>

Non-binding guidelines issued by the Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities in 1995 refer

<sup>15</sup> *Ibid.*

<sup>16</sup> *Ibid.*

<sup>17</sup> See UNEP/CBD/COP/5/Decision V/3, *Progress Report on the Implementation of the Programme of Work on Marine and Coastal Biological Diversity* (implementation of decision IV/5); for copy, see <http://www.biodiv.org/decisions/default.asp?lg=0&m=cop-05&d=03> (last visited 4 October 2002), and UNEP/CBD/COP/5/Decision V/8, “Alien Species that Threaten Ecosystems, Habitats or Species”: <http://www.biodiv.org/decisions/default.asp?lg=0&m=cop-05&d=08> (last visited 4 October 2002).

<sup>18</sup> At COP6 of the Biodiversity Convention in April 2002, alien species were to be a priority issue, see: <http://www.biodiv.org/meetings/cop-06.asp> (last visited 4 October 2002).

<sup>19</sup> <http://jasper.stanford.edu/GISP/> (last visited 19 March 2002).

to the threat of invasive species to marine ecosystems, but do not offer any specific solutions.<sup>20</sup>

*International Maritime Organisation*

In 1997, the International Maritime Organisation (IMO), established under the UN, issued Guidelines for the Control and Management of Ships' Ballast Water to Minimise the Transfer of Harmful Aquatic Organisms and Pathogens.<sup>21</sup> These voluntary guidelines are intended to assist states in their efforts to balance ship safety issues with minimising the risk of introducing harmful aquatic organisms and pathogens through ballast water. They are very general in nature, encouraging co-operation between the vessel and the port, the flag state and the port state. The focus in the guidelines is on procedure, to encourage vessels to develop effective ballast water management plans, and to co-operate with ports in their implementation. The guideline recommends open ocean sediment removal and ballast water exchange where possible.

Discussions are ongoing on a legally binding international instrument, either under MARPOL (1973),<sup>22</sup> or as a separate agreement. The most recent version of the draft agreement is available from the IMO.<sup>23</sup> Generally speaking, the draft convention focuses on the role of the flag state to ensure compliance with the ballast water management requirements set out in the text, but does provide for some port state obligations. Its structure is based on the assumption that existing vessels will be treated differently than new ones, by providing for a phase in schedule for existing vessels.

The draft text provides for reception facilities, an obligation to be imposed on port states. For flag states, it requires surveys of vessels before they are brought into operation and thereafter every five years to ensure the vessel is in compliance with the convention. The draft text also proposes compliance measures and deals with a variety of administrative matters. What it does not do, however, is indicate substantively how to address the problem of invasions from ballast water. There is no consensus, to date, on whether a technology based standard system, a water quality standard system, or some other form of standard would be most appropriate. The debate with respect to ballast water involves issues of ship safety, existing versus new vessels, balancing increased cost against the risk of invasions, and changes in management practices versus changes in ship design.

<sup>20</sup> <http://www.unep.org/unep/gpa/gpapol2.htm> (last visited 4 October 2002).

<sup>21</sup> For more information see IMO Global Ballast website: <http://globallast.imo.org/> (last visited 4 October 2002).

<sup>22</sup> International Convention for the Prevention of Pollution by Ships (MARPOL), UN Legislative Series ST/LEG/SER.B/18 of 2 November 1973, p. 461; (1973) 12 ILM 1319.

<sup>23</sup> See the following document of the Marine Environment Protection Committee of the IMO released at its 46th Session: MEPC 46/3/2 of 19 January 2001, "Harmful Aquatic Organisms in Ballast Water, Draft Consolidated Text of an International Convention for the Control and Management of Ships' Ballast Water and Sediment", submitted by the United States.

Ballast water management options being considered generally fall into three categories, ballast water exchange, ballast water treatment and ballast water isolation. Exchange can either take place sequentially, or by means of the flow-through method. The difference here is that the sequential method is more effective in preventing invasions, but can create challenges for hull integrity. Treatment methods include mechanical treatments (such as filtration), physical treatment (such as ultraviolet), and chemical treatment (such as disinfection or organic biocides). Isolation methods refer to reception facilities or return of ballast water to origin.

While there are some promising possibilities for the long term, there is no one obvious solution to the problem. As a result, given that each option carries with it its own combination of ecological risk, economic costs and benefits, and compliance challenges, it is not surprising that it has proven difficult to reach consensus on an international standard.<sup>24</sup>

#### *Food and Agriculture Organisation*

The Food and Agriculture Organisation (FAO) of the UN has also taken steps to address certain aspects of the issue of aquatic invasive species. Most relevant, perhaps is the Code of Conduct for Responsible Fisheries adopted by the 28th Session of the Conference in November 1995.<sup>25</sup> The Code calls on states to develop international standards and procedures for the introduction and transfer of aquatic organisms. In the meantime, states are asked to minimise or prevent harmful effects of introducing stocks or species, both within their own borders and beyond. The Code includes specific recommendations on steps to be taken prior to introduction, prevention of unauthorised introductions, policies for ongoing introductions and transfers, and steps to be taken before releasing genetically modified organisms.<sup>26</sup> Pre-introduction discussions with neighbouring states are an important part of the process. The Code covers fishing practices and aquaculture. Another related instrument is the 1994 Code of Practice on the Introduction and Transfer of Marine Organisms developed by the International Council for the Exploration of the Sea (ICES)<sup>27</sup> in partnership with a European FAO subcommittee on inland fisheries.

<sup>24</sup> For more information on the technical options under consideration and the current debate on how to move forward, see, for example, the *1st International Ballast Water Treatment Standards Workshop Report*, IMO, March 2001, available at: <http://globallast.imo.org/workshopreport.htm>, and *1st International Ballast Water Treatment R&D Symposium*, IMO, March 2001, available at: <http://globallast.imo.org/abstracts.htm> (last visited 18 March 2002).

<sup>25</sup> FAO (1995). A copy of the Code of Conduct is available at: <http://www.fao.org/fi/agreem/codecond/ficonde.asp> (last visited 4 October 2002).

<sup>26</sup> *Ibid.*, Arts. 6–10.

<sup>27</sup> For a copy of the ICES Code, see: <http://www.ices.dk/pubs/pubs.htm> (last visited 4 October 2002).



*Other relevant international initiatives*

The World Conservation Union (IUCN)<sup>28</sup> has developed Guidelines for the Prevention of Biodiversity Loss Caused by Alien Invasive Species. They provide guidance on the prevention of introduction, re-introduction, and the eradication and control of alien invasive species.

There are a few other related international Codes. One is the 1995 FAO Code of Conduct for the Import and Release of Exotic Biological Control Agents. It outlines obligations for both the exporting and importing country, and was adopted under the International Plant Protection Convention (IPPC) as an international standard for phytosanitary measures. Sanitary and phytosanitary measures, such as those by the FAO and the IPPC, are among the more established and applied international initiatives.

The objective of these measures is to protect humans, animals and plants, either cultivated or wild, from damage as a result of the introduction of pests and diseases. These measures, which focus on import and export controls, generally do not have environmental protection as an objective. Much of the effort in this area relates to land-based species, but they do have implications for aquatic species.

The International Health Regulations formulated by the World Health Organisation contain goals and objectives, which include improving sanitation in ports, and the detection, reduction and elimination of sources of infections that pose a threat to human health.<sup>29</sup> The International Plant Protection Convention (IPPC)<sup>30</sup> provides a framework for action to prevent the spread and introduction of pests of plants and plant products and to promote appropriate control measures. Pests are defined broadly to include any species, strain or biotype, animal or any pathogenic agent that is a threat to plant or plant products. Parties are required to have national systems in place for inspection, reporting, control, risk analysis, phytosanitary security measures before export, and protection of endangered areas. Under the IPPC standards, a three-step pest risk analysis process is set out to justify measures when particular standards do not exist. In North America, the North American Plant Protection Organisation<sup>31</sup> was set up in 1976 through a trilateral agreement involving Mexico, Canada and the US to prevent the introduction and spread of plant pests and noxious weeds and to foster the preservation of plant resources.

<sup>28</sup> The Guidelines, which were formally adopted by the IUCN Council in Feb 2000, are available at the IUCN website at: <http://www.iucn.org/themes/ssc/pubs/policy/invasivesEng.htm> (last visited 4 October 2002).

<sup>29</sup> For more information, see: <http://www.who.int/emc/IHR/IHRtrade.pdf> (last visited 4 October 2002).

<sup>30</sup> International Convention for the Protection of Plants and Plant Products, 23 UST 2767, EIF of 3 April 1952. See <http://www.fao.org/legal/treaties/004t-e.htm> (last visited 4 October 2002), Arts. 2 and 6.

<sup>31</sup> See [http://www.nappo.org/menu\\_e.shtml](http://www.nappo.org/menu_e.shtml) (last visited 4 October 2002).

The issue of sanitary and phytosanitary measures is closely linked to the issue of international trade. Most directly related is the 1995 World Trade Organisation (WTO) agreement on the application of Sanitary and Phytosanitary Measures (SPS Agreement).<sup>32</sup> The WTO regime governs international trade among its 138 member states, based on the principles of non-discrimination, transparency, and predictability.<sup>33</sup> The SPS Agreement allows countries to restrict trade in the process of implementing sanitary and phytosanitary measures, if certain conditions are met. The measures must be based on recognised international standards. The IPPC standards, for example, are recognised by the WTO under the SPS Agreement. Risk assessment must be based on sound scientific principles and evidence, measures must be applied consistently, they must be transparent, and they must not be more trade restrictive than necessary.<sup>34</sup>

In a regional context, under the North American Agreement for Environmental Co-operation,<sup>35</sup> the Council of the Commission on Environmental Co-operation (CEC) has discretion to consider and develop recommendations on the exotic species that may be harmful. Under the North American Free Trade Agreement, Articles 712(1) and 716 provide for state powers to take necessary sanitary and phytosanitary measures in the context of human health and the protection of plant or animal life.

Outside of the context of sanitary and phytosanitary measures, the issue of balancing trade with prevention of invasions has not been addressed. Specifically, the issue of how to balance principles of precaution and prevention under the proposed CBD guidelines with the principles of consistency, transparency and least trade restrictiveness under the WTO has not been resolved at the international level.

Finally, there are a number of North American bilateral agreements worth noting. One is the Convention on Great Lakes Fisheries between the US and Canada,<sup>36</sup> whose purpose is the control and eradication of the Atlantic sea lamprey. Another is the 1992 Environmental Co-operation Agreement between the state of Washington and the province of British Columbia (discussed later at text at note 95 below), the scope of which includes invasive

<sup>32</sup> Agreement establishing the Multilateral Trade Organisation, 33 ILM 1144, 1994; Multilateral Agreement on Trade in Goods, 33 ILM 1154, 1994; and General Agreement on Trade in Services and Annexes, 33 ILM 1167, 1994. For copy of SPS Agreement, see: [http://www.wto.org/english/docs\\_e/legal\\_e/final\\_e.htm](http://www.wto.org/english/docs_e/legal_e/final_e.htm) (last visited 4 October 2002).

<sup>33</sup> For a general overview of WTO policy on trade and the environment, see: [http://www.wto.org/english/tratop\\_e/envir\\_e/envir\\_e.htm#99study](http://www.wto.org/english/tratop_e/envir_e/envir_e.htm#99study) (last visited 4 October 2002).

<sup>34</sup> Note 33 above, Arts. 2, 3, 5 and 7.

<sup>35</sup> North American Free Trade Agreement, (1982) 32 ILM 289, EIF of 1 January 1994; North American Agreement on Environmental Co-operation, (1993) 32 ILM 1480, see Art. 10 (2)(h); [http://www.cec.org/pubs\\_info\\_resources/law\\_treat\\_agree/naaec/index.cfm?varlan=english](http://www.cec.org/pubs_info_resources/law_treat_agree/naaec/index.cfm?varlan=english) (last visited 4 October 2002).

<sup>36</sup> Website: <http://www.glfc.org/pubs/conv.htm> (last visited 4 October 2002).

aquatic species.<sup>37</sup> The International Joint Commission has also carried out work on the issue of invasive aquatic species, particularly in the context of fresh water.<sup>38</sup>

### Overview of the US Legal Framework on Aquatic Invasive Species

Among the many US federal acts that pertain to non-native species, this paper discusses four major federal initiatives that relate most directly to the issue of invasive aquatic species in the US.<sup>39</sup> They include the Lacey Act of 1900,<sup>40</sup> the Non-indigenous Aquatic Nuisance Prevention and Control Act of 1990, the National Invasive Species Act of 1996 and President Clinton's 1999 executive order regarding federal co-ordination of efforts to deal with invasive species.

The Lacey Act represents the first congressional effort to address the problem of invasive species introductions. It prohibits:

“importation into the United States ... of such other species of wild mammals, wild birds, fish (including mollusks and crustacea), amphibians, reptiles, brown tree snakes, or the offspring or eggs of any of the foregoing which the Secretary of the Interior may prescribe by regulation to be injurious to human beings, to the interest of agriculture, horticulture, forestry, or to the wildlife resources of the United States”.<sup>41</sup>

Other parts of the Lacey Act contained in Title 16 of the US Code on Conservation make it illegal “to import, export, transport, sell, receive, acquire, or purchase in interstate or foreign commerce ... any fish or wildlife taken, possessed, transported, or sold in violation of any law or regulation of any State or in violation of any foreign law”.<sup>42</sup> Its impact is limited to controlling intentional introductions of certain listed species of wildlife considered injurious. It uses a “dirty list” or blacklist approach, which means that it applies controls to only those species identified on the list. There are currently 12 mammals, four bird species, one reptile, one mollusk and one crustacean listed under the Act.<sup>43</sup>

The Non-indigenous Aquatic Nuisance Prevention and Control Act of 1990 (NANPCA) was passed in response to the zebra mussel invasion of the Great

<sup>37</sup> “Pathways and Management of Marine Non-indigenous Species in the Shared Waters of British Columbia and Washington”, Puget Sound Water Quality Authority (January 1997). For a copy of the *Report* prepared under this agreement, see: [http://www.wa.gov/puget\\_sound/shared/nis.html](http://www.wa.gov/puget_sound/shared/nis.html) (last visited 4 October 2002).

<sup>38</sup> For more information on the IJC, see: <http://www.ijc.org/ijcweb-e.html> (last visited 4 October 2002), and for a copy of the Great Lakes Water Quality Agreement, see: <http://www.ijc.org/agree/quality.html> (last visited 4 October 2002).

<sup>39</sup> Several other federal laws deal with plant invasives and are not discussed here.

<sup>40</sup> Ch. 553, 31 Stat. 187, partially repealed by Lacey Act Amendments of 1981, Pub L. No. 97–79, 95 Stat. 1073 (codified as amended at 16 USC [subsection] 701, 3371–3378, 18 USC [sections] 42 (1994)).

<sup>41</sup> 18 USC 42(a)(1).

<sup>42</sup> 16 USC 3372(a)(2).

<sup>43</sup> Note 42 above.

Lakes. Zebra mussels were introduced to the Great Lakes through ballast water discharge. The Act provides for the creation of an Aquatic Nuisance Species Task Force, and requires the Secretary of Transportation<sup>44</sup> to put in place rules preventing the release of aquatic invasive species into the Great Lakes from ballast water. Under this Act a mandatory regime went into effect in 1993 applying to ballast water discharge from vessels putting into port in the Great Lakes.

The National Invasive Species Act of 1996 (NISA)<sup>45</sup> creates a mandatory regime to require ships operating in the Great Lakes to exchange ballast water prior to putting into port.<sup>46</sup> This regime contains an exemption from this requirement relating to ship safety, which is in the sole discretion of the vessel masters. The Act provides for the establishment of national guidelines to prevent the introduction of aquatic invasive species as a result of ballast water discharge. To date, only voluntary guidelines have been issued for ballast water outside the Great Lakes Region.

There continue to be numerous discussions about gaps in the policies under both NANPCA and NISA. Issues raised include the broad "safety exemption", the need for new vessel construction standards, the viability of the current salinity test, the use of alternative treatment methods and the exclusion of NOBOBs (no ballast on board) from current policy initiatives.

In President Clinton's 1999 executive order on invasive species,<sup>47</sup> all federal agencies are called upon to identify actions they are engaged in that could impact on the status of invasive species. The order commits agencies to various response measures to ensure that their actions contribute to solving the invasive species problem. The order furthermore establishes another interagency committee, the National Invasive Species Council. Members include the Secretary of State, the Secretary of the Treasury, the Secretary of Defence, the Secretary of the Interior, the Secretary of Agriculture, the Secretary of Commerce, the Secretary of Transportation, the Department of Health and Human Services and the Administrator of the Environmental Protection Agency. The Council issued a Management Plan on 18 January 2001 that presents nine interrelated priority areas for addressing invasive species problems. They include such aspects as national co-ordination, prevention and international co-operation.<sup>48</sup>

The ability of states to regulate the introduction, eradication and control of aquatic invasive species is based on their broad regulatory authority under the

<sup>44</sup> The Guidelines were more specifically developed by the US Coast Guard, which is an agency of the Secretary of Transportation.

<sup>45</sup> 16 USC [subsections] 4701–4751 (Supp. II 1996); see: [http://www.nemw.org/nisa\\_summary.htm](http://www.nemw.org/nisa_summary.htm) (last visited on 19 December 2001).

<sup>46</sup> 16 USC [section] 471(b)(2)(B)(I) (Supp. III 1997).

<sup>47</sup> This replaces an earlier executive order issued by President Carter in 1977.

<sup>48</sup> For a copy of the management plan, see <http://www.invasivespecies.gov/council/nmp.shtml> (last visited 4 October 2002).

US Constitution to protect the health and safety of their citizens and the integrity of their natural resources. Pollution prevention and control is recognised as falling within the general “policing powers” of states. This is subject to two limitations: the commerce clause and the notion of federal supremacy. The commerce clause holds that states cannot discriminate against or unreasonably burden interstate commerce. This has been interpreted to allow for discrimination if it serves a legitimate local purpose and there is no reasonable nondiscriminatory alternative means to achieve that purpose. States can therefore regulate aquatic invasive species introductions under appropriate circumstances. The notion of federal supremacy prevents states from passing laws that are in conflict with laws passed by Congress. This means that states have to consider federal laws when passing state law dealing with this issue.

Various surveys have been conducted of US state laws controlling exotic invasives.<sup>49</sup> They show a variety of attempts to deal with the issue of aquatic invasives but portray an overall inconsistent approach. California, for example, has enacted legislation dealing with ballast water, including reporting requirements and exchange regulations specifically designed for aquatic invasive species introductions.<sup>50</sup> California is using a “clean list” of aquatic invasive species, which means importation into the state of all but those species listed in regulations is prohibited. Similarly, the release of most aquatic invasive species is prohibited. However, aquatic invasive species regulations in California do not currently apply to pathogens, nor do they contain specific provisions for co-operation with and notification to other jurisdictions.

Michigan uses a clean list approach but only for aquaculture.<sup>51</sup> Other states either use their own “dirty lists”, or have no restrictions on the importation or release of aquatic invasive species that go beyond federal laws. With respect to aquaculture, some states such as Washington use ecological risk assessment as part of the licensing process. The states of Oregon and Washington are in the process of developing new regulations on aquatic invasive species, including ballast water.<sup>52</sup>

### Overview of the Canadian Legal Framework on Aquatic Invasive Species

Constitutionally, federal jurisdiction over aquatic invasive species stems from federal power over fisheries and shipping, and the “peace order and good government” clause. The overarching federal policy direction for action on

<sup>49</sup> “Aquatic Nuisance Species Task Force, Findings, Conclusions and Recommendations of the International Introductions Policy Review”, *Report to Congress under Non-indigenous Aquatic Nuisance Prevention and Control Act of 1990*, (1207) 16 USC 4727, and “Analysis of Laws and Policies Concerning Exotic Invasions of the Great Lakes: A Report to the Michigan Department of Environmental Quality” (15 March 1999).

<sup>50</sup> See V. Nadol, “Aquatic Invasive Species in the Coastal West: An Analysis of State Regulation within a Federal Framework”, (1999) 29 *Environmental Law* 339.

<sup>51</sup> Mich. Comp. Laws 286.875 (1).

<sup>52</sup> V. Nadol, note 50 above.

aquatic invasive species in Canada appears to come predominantly from the Canadian Biodiversity Strategy (1995).<sup>53</sup> The strategy calls for national and international databases to provide means to anticipate, identify and monitor alien organisms, screening standards, risk assessment, elimination of common sources of unintentional introductions, effective control and eradication measures supported by strong legislation and enforcement, public education and research. This is complemented by Canada's National Wildlife Policy, which states that no non-indigenous species should be introduced into a natural ecosystem, and that introductions into modified ecosystems should only be permitted under limited circumstances.<sup>54</sup>

At the federal level, the Fisheries Act<sup>55</sup> contains provisions governing the conservation and protection of fish and fish habitat. It is the federal Act, which most directly addresses threats from aquatic invasive species. It includes licence requirements for the release of live fish into any fish habitat, any transfer of live fish to a rearing facility, and regulations dealing with live bait. Importation of cultured fish and eggs or wild fish also requires a permit. Responsibility for implementing this Act rests with Fisheries and Oceans Canada, although responsibility for inland fisheries lies with the provinces.<sup>56</sup> Fisheries and Oceans Canada has developed a draft National Policy on Introductions and Transfers of Aquatic Organisms.<sup>57</sup> The policy is primarily aimed at conserving the production capacity of the fisheries resource. As such, it may not address the full range of issues regarding aquatic invasives in a comprehensive manner.<sup>58</sup> A recent report by the Auditor General of Canada highlighted areas of concern in how the federal government is meeting its legislative obligations under the Fisheries Act to protect wild Pacific salmon stocks and habitat from the effects of salmon farming including from the escape of farmed Atlantic salmon.<sup>59</sup>

Section 657.1 of the Canada Shipping Act<sup>60</sup> provides for the power to pass ballast water regulations. No such regulations have been passed to date. Currently the Department of Fisheries and Oceans is administering voluntary

<sup>53</sup> See Environment Canada's website on biodiversity at: [http://www.ec.gc.ca/wild\\_e.html#biodiversity](http://www.ec.gc.ca/wild_e.html#biodiversity) (last visited 4 October 2002), for a copy of Canada's strategy. For more information on Canada's biodiversity strategy see: [http://www.qc.ec.gc.ca/faune/faune/html/biodiversity\\_strategy.html](http://www.qc.ec.gc.ca/faune/faune/html/biodiversity_strategy.html) (last visited 4 October 2002). Invasive species are recognised as a threat to biodiversity in *The State of Canada's Environment*, see: <http://www.ec.gc.ca/soer-ree/English/1996Report/Doc/1-8-4-5-6-1.cfm> (last visited 4 October 2002).

<sup>54</sup> See C. Keddy, M. Smith and B. Tegler, "The Role of Importation Control in Protecting Native Canadian Biodiversity", (1999) *Canadian Wildlife Service* 104.

<sup>55</sup> RSC 1985 c. F-14.

<sup>56</sup> See *Canadian Environmental Law* (Butterworths, 2nd ed., 1996), Chapter 4, paras. 4.85–4.110.

<sup>57</sup> DFO (1998).

<sup>58</sup> See C. Keddy *et al.*, note 54 above, p. 91.

<sup>59</sup> "The Effects of Salmon Farming in British Columbia on the Management of Wild Salmon Stocks", Ch. 30, *Report of the Auditor General of Canada*, December 2000.

<sup>60</sup> RSC 1985, c. S-9.

guidelines known as the Great Lakes Ballast Water Control Guidelines.<sup>61</sup> These guidelines encourage vessels in the Great Lakes and Hudson Bay region to exchange near shore ballast water in open waters, to reduce the risk of introduction of aquatic invasive species in near shore ecosystems. The Port of Vancouver and two other British Columbia ports have used port legislation to implement a mandatory ballast water exchange regime.<sup>62</sup>

Other related federal legislation includes the Canadian Environmental Protection Act (CEPA (1999)) and the Canadian Environmental Assessment Act (CEAA). Environment Canada considers alien species, including micro-organisms, to be new substances under CEPA (1999), and thereby subject to regulation.<sup>63</sup> Under this interpretation, anyone wishing to introduce a new alien species into Canada could be required to provide sufficient information to allow Health Canada and Environment Canada, the responsible government departments, to conduct a risk assessment to identify possible risks to human health or to the environment including its biodiversity.<sup>64</sup> CEPA could then provide an opportunity for a federal assessment before intentional introductions of new species take place leading to prohibition or acceptance of the introduction or the imposition of conditions. The requirements of CEPA could be applied on an ecosystem basis, which means separate notification and risk assessment could be required for each ecosystem. The implementation of these provisions is left to the discretion of the Minister.

Under CEAA,<sup>65</sup> the introduction of an alien species can be listed as an activity requiring an environmental assessment. This has, in fact, been done for certain introductions of animals licensed by the Canadian Food Inspection Agency under the Health of Animals Act.<sup>66</sup> The result is that a consideration of environmental implications is superimposed on the regulator, who previously only had to consider issues of human health and protection of certain commercially important plants and animals. CEAA also requires the consideration of cumulative effects, a crucial concept in the context of invasive species. The Act does not, however, specifically identify the threat of invasive species as an environmental effect to be considered in conducting environmental assessments. This means in practice that unintentional introductions through

<sup>61</sup> See C. Keddy, "Canada's Capability for Managing Alien Organisms: Implications for Conserving Native Biodiversity", (1997) *Canadian Wildlife Service* 29.

<sup>62</sup> See Chris Wiley, "Ballast Water Management in Canada: National Direction, Regional Realities", (2000) *Tol. J. Gr. Lakes L. Sci & Pol'y* 249.

<sup>63</sup> See Canadian Environmental Protection Act, SC (1999), Ch. C-15.31 (1999, c. 33), S. 3(1), definition of substance.

<sup>64</sup> Based on discussions with Paul Chamberland, Canadian Wildlife Service, February 2001. This is an interpretation generally accepted within Environment Canada, but it has not been applied in practice to date.

<sup>65</sup> SC (1992), c. 37.

<sup>66</sup> SC (1990), c. 21

projects that are assessed under CEAA may not always be addressed, unless the risk of invasion is identified in the scoping process.

The Wild Animal and Plant Protection and Regulation of International and Interprovincial Trade Act (WAPPRIITRA)<sup>67</sup> regulates international and interprovincial trade in wildlife in order to protect Canadian ecosystems, wild animals and plants. It provides a national framework for co-ordinating animal and plant importation. Currently, only a limited number of species require a permit under the Act for importation into Canada, essentially a “dirty list” approach. With respect to interprovincial transport, WAPPRIITRA adopts provincial regulations, which often exclude aquatic species as they are regulated under fishing regulations.<sup>68</sup>

Provincial jurisdiction over aquatic invasive species in Canada arises primarily from the specific pathway or commercial activity affected. Examples of pathways and commercial activity over which provinces have jurisdiction include tourism, commerce in aquarium organisms, and regulation of the aquaculture industry. For example, a 1988 Memorandum of Understanding on Aquaculture Development between the Federal Department of Fisheries and Oceans and the Province of British Columbia assigns to the province primary responsibility for the management and development of the aquaculture industry. Effective implementation of prevention, eradication and control measures for these pathways therefore requires co-operation from the provinces.

The importance of provincial co-operation becomes even more obvious when one considers the delegation of federal power that has taken place for the inland fishery. It is provincial authorities that generally deal with the importation, transfer and release of fish into inland waters, with fish bait and with the regulation of fish stocking. Aquaculture is regulated provincially, even in marine waters through delegation. The general approach in provincial legislation for aquaculture is to require a permit for any aquaculture operation. Little guidance is provided in legislation on how permit decisions will be made or who bears the risk of escapes. Moreover, provincial legislation on aquaculture, fish bait and fish stocking deals primarily with commercial considerations for these activities, not with the potential threat to biodiversity.<sup>69</sup>

In summary, provincial efforts to deal with aquatic invasives species are a patchwork initiative with little consistency among provinces. The focus is generally on commercial and direct human impact, not on environmental and biodiversity protection.

<sup>67</sup> SC (1992), c. 52

<sup>68</sup> See C. Keddy *et al.*, note 54 above.

<sup>69</sup> See discussion in C. Keddy *et al.*, note 54 above.



### Overview of Mexico's Legal Framework on Aquatic Invasive Species<sup>70</sup>

In Mexico, the regulatory framework for the protection of the environment in general has its underpinnings in a set of legal principles set out in Articles 25 and 27 of the Constitution, enshrining the right of the nation to regulate the use of natural resources for purposes of conservation. These principles are put into effect through government policies and agencies that regulate economic activities relating to natural resources, including fisheries and aquaculture.

Based on these constitutional principles, the General Law on Ecological Balance and Environmental Protection (*Ley General del Equilibrio Ecológico y la Protección al Ambiente*—LGEEPA) sets out the criteria to be observed in the preservation and sustainable use of flora and fauna. It empowers the federal government to regulate their protection and preservation, and it explicitly establishes the obligation to protect aquatic ecosystems. It empowers the Ministry of the Environment and Natural Resources (*Secretaría del Medio Ambiente y Recursos Naturales*—Semarnat) to issue technical standards for the protection of species.<sup>71</sup> Specifically, the LGEEPA authorises Semarnat to impose restrictions on the circulation over national territory of wildlife species originating from or destined for other countries, and to co-ordinate with the Ministry of the Economy (*Secretaría de Economía*) for the establishment of regulations or restrictions on the import and export of wildlife specimens.<sup>72</sup>

Regarding the “use” and “enjoyment” of live aquatic resources, the LGEEPA<sup>73</sup> refers to the provisions of the Fisheries Law (*Ley de Pesca*).<sup>74</sup> This latter derives its authority from Article 27 of the Constitution insofar as it relates “to the natural resources constituted by the flora and fauna whose habitat ... is water”. Its purpose is to “... guarantee the conservation, preservation and rational use of fisheries resources and to establish the basis for their suitable development and administration ...”.<sup>75</sup>

Of relevance to the issue of aquatic species, is Article 3 of the Fisheries Law, which empowers the Ministry of Agriculture, Livestock, Rural Development, Fisheries and Food (*Secretaría de Agricultura, Ganadería, Desarrollo Rural, Pesca y Alimentación*—SAGARPA)<sup>76</sup> to authorise the introduction of aquatic

<sup>70</sup> Much of the content of this section is based on information generously provided by Dr. Porfirio Alvarez Torres, Director General de Investigación en Acuicultura Instituto Nacional de Pesca

<sup>71</sup> LGEEPA Article 5, par. XI, Article 88, par. I and Article 96.

<sup>72</sup> LGEEPA Article 85, in relation to the reforms to Article 32 bis par. XX of the Organic Law of the Federal Public Administration (*Ley Orgánica de la Administración Pública Federal*—LOAPF), published in the Official Gazette of the Federation (*Diario Oficial de la Federación*) on 30 November 2000.

<sup>73</sup> Article 94.

<sup>74</sup> Published in the Official Gazette of the Federation on 25 June 1992.

<sup>75</sup> Art. 1 of the Fisheries Law.

<sup>76</sup> Prior to the amendments to the LOAPF of 30 November 2000, these powers were exercised by the Ministry of the Environment, Natural Resources and Fisheries (*Secretaría del Medio Ambiente, Recursos Naturales y Pesca*—SEMARNAP).

wildlife species, promote the development of aquaculture as well as to order measures—in co-ordination with SEMARNAT—for the conservation of aquatic species.<sup>77</sup>

This law provides that the introduction of live species into bodies of water requires the “authorisation” of the SAGARPA.<sup>78</sup> The application for this authorisation must contain general information on the species to be introduced, the proposed place of introduction, and specific information on the quantity to be introduced and the stage of development of the species, among other information.<sup>79</sup> In addition, the Regulation to the Fisheries Law requires an aquacultural health certificate and a report stating that the genome of the species will not alter the species inhabiting the body of water in question. For imported species, there is the further requirement of a study on the disease history of the area of origin as well as the genetic history. For species that do not exist naturally, a technical study on the biology and habits of the species must also be submitted. The Regulation also provides that for exotic species, the potential effects of the introduction of the species on native flora and fauna must be described.

Furthermore, the Regulation states that the Ministry will only authorise the introduction of live species of aquatic flora and fauna onto national territory upon presentation of a health certificate issued by the competent authority of the country of origin.<sup>80</sup> The introduction of species causing harm to, altering or endangering fisheries resources is punishable under the Fisheries Law by a penalty ranging from a fine to seizure and revocation of the authorisation (and in the case of aquaculture, of the concession to carry on the activity).<sup>81</sup>

To implement these regulations, a series of technical standards have been issued on the use and enjoyment of fish resources. In particular, the requirements for obtaining an authorization to introduce live aquatic flora and fauna into the Vicente Guerrero reservoir in Tamaulipas<sup>82</sup> and the El Infiernillo reservoir in Michoacán<sup>83</sup> are set out in the relevant standards.

Also, since the previous “... indiscriminate introduction without sanitary controls ...” of aquatic live organisms onto the territory “ was the mechanism whereby various pathogens were dispersed ” among the country’s aquaculture facilities, in 1994 a technical standard<sup>84</sup> was published to establish health

<sup>77</sup> Art. 3, paras. IV, VI and VIII of the Fisheries Law.

<sup>78</sup> Art. 15, para. IV of the Fisheries Law.

<sup>79</sup> Art. 125 of the Fisheries Law Regulation, published 29 September 1999.

<sup>80</sup> Art. 128 of the Fisheries Law Regulation, published 29 September 1999.

<sup>81</sup> Art. 24, para. XXIV and Art. 25 of the Fisheries Law.

<sup>82</sup> Mexican Official Standard NOM-024-PESC-1999, published in the *Official Gazette of the Federation*, 9 February 2000.

<sup>83</sup> Mexican Official Standard NOM-027-PESC-2000, published in the *Official Gazette of the Federation*, 31 October 2000.

<sup>84</sup> Mexican Official Standard NOM-010-PESC-1993, published in the *Official Gazette of the Federation*, 16 August 1994.

requirements for the import onto national territory of live aquatic organisms in any of their stages of development for use in aquaculture or as pets.

There is another legal tool which, in varying degrees, relates to the issue of species introduction in that the protection of aquatic species is one of its proximate objectives. This instrument is the National Fisheries Chart (*Carta Nacional Pesquera*). Developed by the SAGARPA, it is an indicator of the availability and conservation status of fisheries and aquaculture resources. It is intended to guide the management of these resources, but also to establish guidelines and strategies for the protection, restoration and use of aquatic resources as well as for the productive activities with a potential effect on ecosystems. The most recent version of this instrument<sup>85</sup> presents indicators in the form of charts or data sheets for various headings, categorising the information and analysing the status of the resources, identifying problems and recommending measures. Two examples are relevant to this issue. Regarding the status of shrimp, the Chart recommends research into biotechnological cultivation techniques for species native to the Gulf of Mexico and the application of standards for controlling the introduction of exotic species into the country. Regarding the San Quintin, Baja California coastal lagoon ecosystem, it recognises the introduction of unauthorised species as having an environmental impact.

As may be noted, the legal tools so far commented regulate the intentional introduction of aquatic species and their main focus is not the biodiversity conservation but rather sanitary issues affecting the use of the resource. That is, they tend to focus more on the introduction of diseases affecting the use of the resource than on protection of native species in maintaining ecological balance.

The EIA takes a different approach. It is an instrument whereby Semarnat establishes the conditions governing activities that may cause ecological imbalance. Specifically, the LGEEPA Regulation on this matter provides that<sup>86</sup> anyone wishing to carry on aquaculture activities involving the stocking of aquatic ecosystems with exotic species, hybrids and transgenic varieties must possess the relevant EIA. This varies from the approach under the National Fisheries Chart, since the direct object of this instrument is the protection of ecological stability as such, not merely the use of the resource.

Also noteworthy is the Fisheries Law Regulation,<sup>87</sup> whose aquaculture provisions characterise “Developmental Aquaculture” as being carried on for the purpose of scientific research and experimentation for the development of biotechnological techniques at any stage of the cultivation of aquatic species. For this activity, the Regulation provides that the interested party does not require a concession but rather a permit from the Ministry, which is granted where the

<sup>85</sup> Published in the *Official Gazette of the Federation*, 17 August 2000.

<sup>86</sup> Art. 5, para. U) III of the LGEEPA Regulation on Environment Impact, published in the *Official Gazette of the Federation*, 30 May 2000.

<sup>87</sup> Art. 114.

applicant is in compliance with the aquaculture health standards and is contributing to the preservation of the environment and the conservation of species.

The main agencies involved are the SAGARPA and Semarnat. However, it is important to reference the inspection and enforcement role played by the Federal Attorney for Environmental Protection (*Procuraduría Federal de Protección al Ambiente*—Profepa). As a separate unit within Semarnat, it is empowered<sup>88</sup> to enforce compliance with the environmental provisions relating to aquatic flora and fauna, and is specifically authorised<sup>89</sup> to conduct enforcement activities and prevent the unauthorised introduction of aquatic flora and fauna species. Its General Co-ordination of Ports, Airports and Borders (*Coordinación General de Puertos, Aeropuertos y Fronteras*) is mandated to verify that all legal requirements are accomplished when introducing aquatic species into the country.

### Summary

The foregoing survey highlights the fact that many laws dealing with invasive species were drafted to address a narrower set of issues than those of concern today. Tools developed to deal with threats to agriculture or human health are incomplete or inconsistent with broader ecosystem concerns. It is beyond the scope of this paper to catalogue the gaps or inconsistencies in the legislation and policy in all three countries. The March 2001 meeting of the Subsidiary Body on Scientific, Technical and Technological Advice under the Convention on Biological Diversity reviewed existing measures and instruments to identify gaps and needs on a global basis. The resulting report, "Invasive alien species: Comprehensive review on the efficiency and efficacy of existing measures for their prevention, early detection, eradication and control",<sup>90</sup> canvasses many of the gaps in existing instruments as well as other factors affecting the efficiency of existing efforts.

To address these concerns and others, some common themes have emerged in the writings on this subject, both regionally in North America and internationally. Not only have there been efforts to find better ways to collaborate internationally but there has also been some effort to put into place effective law and policy tools for domestic implementation. The rest of the paper discusses international principles or approaches as a foundation for collaboration; and aspects of a comprehensive law and policy framework.

### Principles or Approaches to be Considered as a Basis for a Framework for Collaboration

This section considers principles or approaches that could form the basis of either collaborative or individual actions within the various jurisdictions in

<sup>88</sup> Art. 62, para. I of the Internal Regulation of the Semarnat.

<sup>89</sup> Art. 72, para. VI of the Internal Regulation of the Semarnat.

<sup>90</sup> UNEP/CBD/SBSTTA/6/7, available at: <http://www.biodiv.org/doc/meeting.asp?wg=SBST-TA-06> (last visited 4 October 2002).

Canada, Mexico and the US. A good starting point would be the implementation of measures that have received international recognition with respect to invasive species. At its meeting in Montreal, 12–16 March 2001, the SBSTTA discussed the Interim Guiding Principles for the Prevention, Introduction and Mitigation of Impacts of Alien Species. These guiding principles are listed in summary fashion below:

- General
  - Guiding principle 1: Precautionary approach
  - Guiding principle 2: Three-stage hierarchical approach
  - Guiding principle 3: Ecosystem approach
  - Guiding principle 4: State responsibility
  - Guiding principle 5: Research and monitoring
  - Guiding principle 6: Education and public awareness
- Prevention
  - Guiding principle 7: Border control and quarantine measures
  - Guiding principle 8: Exchange of information
  - Guiding principle 9: Co-operation, including capacity building
- Introduction of species
  - Guiding principle 10: International introduction
  - Guiding principle 11: Unintentional introduction
  - Guiding principle 12: Mitigation of impacts
  - Guiding principle 13: Eradication
  - Guiding principle 14: Containment
  - Guiding Principle 15: Control

Many of these principles are also found in the IUCN Guidelines for the Prevention of Biodiversity Loss caused by Alien Invasive Species, and are at the root of efforts in some jurisdiction within North America. For example, Guiding Principle 9 on Co-operation is based on the responsibility under international law that countries must ensure that activities within their jurisdiction or control do not cause harm to the environment of other countries. It implies having in place effective laws and institutions. While much work remains to be done at the international level, there seems to be some momentum on this issue within a number of international organisations, including the IMO, IUCN, FAO, and at UNEP in the context of the CBD. In North America, there are long-standing bi-national efforts between the US and Canada<sup>91</sup> on Great Lakes water issues.

<sup>91</sup> For efforts by the IJC, and for a copy of the Great Lakes Water Quality Agreement, see: <http://www.ijc.org/ijcweb-e.html> (last visited 4 October 2002). For a recent white paper by the IJC on aquatic invasive species see also <http://www.ijc.org/milwaukee/wrkshps/eplegal.html> (last visited 4 October 2002).

By way of illustration, the Great Lakes Fishery Commission was established under the Convention of Great Lakes Fisheries and is mandated to recommend appropriate measures to ensure maximum sustained productivity of fish stocks. Its recommendations on exotics in ballast water in 1988 prompted the development of the voluntary Canadian ballast guidelines and the enactment of NANPCA in the US. The Great Lakes Commission established a regional Panel on Aquatic Nuisance Species. In addition, the Great Lakes Water Quality Agreement (between the US and Canada) has mandated the International Joint Commission to provide advice to the US and Canada with recommendations on water quality. Although primarily focused on chemical contamination, exotic species and ballast water are mentioned in Annex 6 to this Agreement.

Much of the work at the international level has been driven by the recognition that the issue of invasive species must have a strong international co-ordination component coupled with national efforts. At COP5 of the Convention on Biological Diversity in May 2000, the Global Invasive Species Programme (GISP) recommended a number of global, regional and national priorities. Global priorities identified include the following:<sup>92</sup>

- Development of electronic and printed databases to assist in the sharing of most up to date information on alien invasive species and thereby improve opportunities for prevention and early eradication.
- Engaging key sectors involved in activities that can lead to new introductions, including shipping, pet trade, tourism, aquaculture, and botanical and zoological collections.
- Research for more effective alien species prevention and management approaches, including models for predicting invasiveness.
- Harmonisation of terminology.
- Harmonisation of methodology (for example, Environmental Risk Assessment (ERA) approaches).<sup>93</sup>

National and regional priorities were considered to include the following:<sup>94</sup>

- Development of national capacity in invasive species prevention and management.

<sup>92</sup> These recommendations were prepared by GISP for COP5. For a copy, contact Martha Chouchena-Rojas at [mtr@hq.iucn.org](mailto:mtr@hq.iucn.org). There was no formal response at COP5, other than to identify invasives as a priority issue for COP6. For information on decisions at COP5, see: <http://www.biodiv.org/doc/meetings/cop/cop-05/official/cop-05-12-en.pdf> (last visited 4 October 2002). See also L. Glowka, "Bioprospecting, Alien Invasive Species, and Hydrothermal Vents: Three Emerging Issues in the Conservation and Sustainable Use of Biodiversity", (2000) 13 *Tulane Environmental Law Journal* 329–360.

<sup>93</sup> *Ibid.*

<sup>94</sup> Based on personal communications with Murray Hill, Nova Scotia Department of Agriculture and Fisheries, January 2001, and follow-up in December 2001. This process appears to be in the early stages, there do not appear to be any written documents available.

- Encouragement of regional co-operation to address regional threats.

One example of active co-operation between jurisdictions in North America is the 1992 Co-operative Agreement between the US Environmental Protection Agency (EPA) and the Canadian Department of Fisheries and Oceans (DFO). Under the agreement, the parties commissioned a report to assist the Washington and British Columbia Working Groups on Minimising the Introduction of Exotic Species in developing their recommendations to the British Columbia/Washington Environmental Co-operation Council. The report, which came out in 1997, looks at the status and management of non-native invasive species introductions into the shared marine waters of British Columbia and Washington State. It evaluates pathways of invasive species introduction and management programmes in place to address them. Recommendations include the development of baseline information and assessment methods, education, information exchange between jurisdictions, and the use of voluntary programmes where effective.<sup>95</sup>

In addition, The Gulf of Maine Council on the Atlantic coast of Canada and the US may provide an effective vehicle to promote regional co-operation on this issue. This Council, which has been in existence for over ten years, involves five state and provincial jurisdictions as formal parties to the Council, and is supported by the national governments of Canada and the US. It brings government officials from these seven jurisdictions together to identify and address common areas of concern with respect to the Gulf of Maine and the Bay of Fundy. The issue of aquatic invasive species was recently identified as a suitable issue for the Council to address.

Finally, there are a number of existing trilateral initiatives in place among Mexico, Canada and the US that could play a role in future collaborations. They include the International Association of Fish and Wildlife Agencies (1902), the Waterfowl Management Plan—Eastern Habitat Joint Venture (1986), the North American Wildlife Enforcement Group (1995), and the Trilateral Committee for Wildlife and Ecosystem Conservation and Management (1996). These existing organisations may be potential partners to assist with inter-jurisdictional co-ordination. For example, the North American Wildlife Enforcement Group will be sponsoring a trilateral seminar on enforcement issues relating to invasives in 2002 and may be an appropriate body to assist in addressing certain enforcement issues common to all three countries.

### **Law and Policy Tools**

This section outlines certain law and policy tools and responses that have been advocated in the context of invasive species. They include:

<sup>95</sup> See (1997) *Report* at [http://www.wa.gov/puget\\_sound/shared/nis.html](http://www.wa.gov/puget_sound/shared/nis.html) (last visited 4 October 2002), pp. 40–41.

- ecological risk assessment
- co-ordinating institutions
- economic instruments
- permitting

### Ecological Risk Assessment

Risk analysis as a control mechanism has been used internationally for many years in the “invasives context”. It is required under certain international agreements, such as the WTO SPS Agreement, the IPPC and the Cartagena Protocol on Biosafety.

Under the IPPC, Pest Risk Analysis standards have been developed that are recognised under the WTO SPS Agreement. These standards set out a three-stage process for risk analysis: initiating the risk analysis process, assessing the risk and managing the risk. Following this process, parties make determinations as to whether phytosanitary measures are required. If such measures are found to be required, the process also directs how decisions are made about the appropriate response or options for response to the risks identified. The present version of the IPPC standards on Pest Risk Analysis focuses on economic implications.<sup>96</sup> However, the need to revise the IPPC standards with the aim of broadening the scope to include environmental considerations has been identified.<sup>97</sup>

There are a number of contexts in the US and Canada that already apply risk analysis in some form. In the US, at the federal level, the EPA has developed Ecological Risk Analysis standards.<sup>98</sup> There is also a Risk Assessment and Management process established under the Aquatic Nuisance Prevention and Control Act 1990. This review process was based on the Generic Non-Indigenous Pest Risk Assessment Process,<sup>99</sup> which was developed by the Animal and Plant Health Inspection Service (APHIS) of the US Department of Agriculture.<sup>100</sup>

In addition, the Canadian Environmental Protection Act applies an ecological risk assessment process before permitting the introduction of any new species. So far, however, there is no recognised Canadian standard for ecological risk analysis. An effort is under way in Canada involving the Department of Fisheries and Oceans as well as its provincial counterparts to develop a standard ecological risk assessment process for implementation of the Fisheries Act, specifically in the context of fish stocking, live bait and aquaculture. It is not clear to what extent this ecological risk assessment

<sup>96</sup> See current text of IPPC at: <http://www.fao.org/legal/treaties/004t-e.htm> (last visited 4 October 2002).

<sup>97</sup> J. Hedley, *The IPPC and Invasives* (IUCN, 2000).

<sup>98</sup> So far, this USEPA standard appears to be non-binding, available to be applied by any jurisdiction.

<sup>99</sup> Risk Assessment and Management Committee 1996; Orr *et al.* (1993).

<sup>100</sup> There is no indication on the APHIS website that this Risk Assessment Process is still being applied or published by the APHIS.



process currently under development may have broader application to invasives in other media.<sup>101</sup>

Aquaculture provides a good example of the application of risk analysis to invasives. British Columbia and Washington have both had risk analysis procedures in place for at least a decade. These procedures have resulted in intentional introductions of aquaculture species being more restricted now than in the past. Regulatory structures both in British Columbia and Washington require an extensive review process before fish, shellfish or marine plants from other continents or from the east coast of North America (including species that have already become established on the Pacific coast) can be introduced to the shared Pacific waters.<sup>102</sup>

In both British Columbia and Washington, ecological, genetic and animal health/disease issues are considered in evaluating permit requests; however, the health and disease requirements are far more specific than those for ecological and genetic issues. The disease-free requirements include inspection of source production facilities, health records from these facilities, disinfection procedures, and quarantine and testing of imported eggs. As a result, the risk of introducing infectious diseases with imported aquaculture products is markedly reduced and considered negligible by resource managers.<sup>103</sup>

One of the main variances among risk assessment processes being used is their scope. Most are directed to human health and economic risks. Only a few are starting to incorporate environmental factors in the risk analysis. Given the current trend toward reducing barriers to trade, how can countries design policies which balance the economic pressures for free trade against the need to impose restrictions to protect biodiversity? How can countries take effective measures to protect native species, their habitats, and ecosystems without risking trade violations?<sup>104</sup>

As suggested by the WTO SPS agreement, standardised methodologies have the advantage of providing a basis for distinguishing between appropriate regulatory responses and non-tariff barriers to trade. Furthermore, standards can provide consistency among the various jurisdictions involved, and can be an important step toward reducing the risk of introduction across political boundaries. Risk analysis standards can achieve this by ensuring that similar processes and criteria are being applied to determine whether and under what

<sup>101</sup> Based on personal communications with Murray Hill, Nova Scotia Department of Agriculture and Fisheries, January 2001, updated December 2001. As this process appears to be in the early stages, no written documents are available.

<sup>102</sup> (1997) *Report*, note 95 above, pp. 16–20.

<sup>103</sup> *Ibid.*

<sup>104</sup> For a consideration of how to include the risk of invasion in economic assessment, see Jason F. Shogren, “International Environmental Risk: A Taxonomy” and Edward Barbier, “How to Allocate Biodiversity Internationally” in Horst Siebert, *The Economics of International Environmental Problems* (Institute fuer Weltwirtschaft and der Universitaet Kiel, 2000).

circumstances to allow activities that may lead to introduction of invasive species. Can a North American joint effort identify the parameters and standards needed for ecological risk assessment in the context of aquatic invasives?

### Co-ordinating Institutions

There are two fundamentally different approaches to national or regional co-ordination of the regulation of invasive species introductions. One is to set up a co-ordinating body that includes representatives of all regulators currently dealing with some aspects of the issue. The other approach is to establish a new regulatory authority to ensure a comprehensive regulatory approach to the issue. New Zealand has adopted the latter approach, whereas the United States has adopted the former. In Canada discussions on this issue are ongoing, in the context of efforts to formulate a national strategy on invasives.

The New Zealand approach of establishing a new central agency involves a comprehensive review and consolidation of existing measures on invasive species into a new legislative framework covering all categories of species, all sectors, all ecosystems, all potential pathways and a full range of response measures. The US approach under the National Invasive Species Council involves co-operation and co-ordination among existing regulators to ensure a comprehensive response to the threat of invasive species. It requires legislative and regulatory changes where there are gaps or inconsistencies that prevent an effective, standard, co-ordinated regulatory approach.<sup>105</sup>

Isolated action by individual states can never be sufficient to manage the full extent of activities that lead to invasions. Institutional frameworks at the national, regional and international level can foster the co-ordination and collaboration needed to address gaps, weaknesses and inconsistencies. Efforts in British Columbia and Washington illustrate what has and can be done to respond to a specific pathway, and what role international co-operation may play in enhancing existing efforts by various jurisdictions on invasives.

In Canada and the US, legislative, regulatory and policy development regarding the aquaculture industry has taken place at the state and provincial level. The focus has often been to address conflicting-use issues, protection of commercial interests and concern about human health. Aquaculture as a pathway for the introduction of aquatic invasive species has been recognised in some of the regulatory frameworks and policies that have been developed, particularly on the West Coast.

In British Columbia, aquaculture is regulated under the provincial Fisheries Act.<sup>106</sup> It provides for a permitting process for aquaculture.<sup>107</sup> Shellfish

<sup>105</sup> For a general discussion of this issue, see C. Shine, N. Williams and L. Gruendling, "A Guide to Designing Legal and Institutional Frameworks on Alien Invasive Species", *Environmental Policy and Law Paper No. 40* (IUCN Environmental Law Centre, 2000), p. 41.

<sup>106</sup> Act RSBC (1996), c. 149.

<sup>107</sup> BC Regulation 364/89, as amended 31 October 2000 sets out the permitting process.

aquaculture has been practised in British Columbia for over 100 years. An intensive salmon aquaculture has been a strong and growing industry since 1980. British Columbia has used risk assessment analysis for the introduction of aquatic invasive species through aquaculture for at least ten years.<sup>108</sup>

In Washington State, the industry is similarly well established, although at a lesser scale than British Columbia. Similar to BC, there is a fairly extensive review process in place to be followed before non-indigenous species including fish, shellfish or marine plants from outside the West Coast can be introduced. In addition to a permitting process implemented through the Washington Administrative Code, the state requires that the application undergo a multi-agency review at the state level.<sup>109</sup>

Both jurisdictions consider ecological, genetic, and animal health/disease issues in evaluating permit requests. One difference between the two jurisdictions is that Washington legislation applies to plant organisms, whereas British Columbia's does not. It would appear, overall, that through the work of the British Columbia/Washington Environmental Co-operation Council and related organisations, attempts have been made to co-ordinate efforts to prevent the introduction of aquatic invasive species through aquaculture activities.<sup>110</sup>

A 1997 report on Pathways and Management of Marine Non-indigenous Species in the Shared Waters of British Columbia and Washington outlines threats associated with the aquaculture industry, including importation of Asian oyster seed, Atlantic salmon eggs and the Japanese scallop. Based on the study, the two jurisdictions have co-operated in either eliminating the need for importation, or have carried out extensive study of potential risk in at least one of the jurisdictions.<sup>111</sup>

The two jurisdictions are currently focusing on sharing information and identifying opportunities for co-operation. Working groups on this issue developed the following elements of a transboundary strategy:

- Education about the issues, pathways, and the role of the public
- Controlling pathways for introductions
- Rapid response and remediation
- Effective monitoring of control efforts and detection of new introductions
- Resources for management actions
- Research on invasive potential of alien species in the context of the local ecosystem, on possible pathways for introductions, and on control techniques
- Co-ordination involving governments and non-governmental organisations

The report also identified the need for co-operation in the following areas:

<sup>108</sup> (1997) *Report*, note 95 above, p. 16–20.

<sup>109</sup> *Ibid.*, pp. 16–20.

<sup>110</sup> (1997) *Report*, note 95 above, and Puget Sound/Georgia Basin International Task Force, "Pathways to Our Optimal Future: A Five-Year Review of the Activities of the International Task Force, Draft for Discussion", October 1999.

<sup>111</sup> (1997) *Report*, note 95 above, p. 20.

- (1) Joint clean lists as the basis for a co-ordinated regulatory response.
- (2) A harmonised environmental risk assessment process.
- (3) Ensuring that decisions about whether to permit the introduction of a species are consistent.
- (4) Co-ordination in monitoring introductions that are permitted in the context of the aquaculture industry.
- (5) Co-operation in responding to introductions that turn out to be invasive.

On the East Coast in Canada, the industry is less developed, as is the regulatory approach. While general permitting procedures exist in a number of Atlantic Provinces, such as New Brunswick and Nova Scotia, the risk of invasive species either through escapes or through pathogen contamination is generally not reflected in the regulatory approach. In New Brunswick, for example, a permit can be refused if the regulator determines that the proposed operation poses an unacceptable environmental risk.<sup>112</sup> However, the threat of invasive species is not specifically identified as an unacceptable environmental risk, and the onus is on the regulator to identify unacceptable risk, rather than on the proponent to demonstrate that the risk is acceptable and can be minimised through mitigation measures.

The Gulf of Maine Council provides a possible mechanism for facilitating co-operation among jurisdictions on the eastern seaboard, but it is just starting to focus on this issue.<sup>113</sup> It is an existing structure with experience in dealing with a range of marine environmental issues over its ten years of existence. One challenge on the East Coast in Canada and the US appears to be how to give greater priority to the issue of aquatic invasive species.

The overriding challenge is how to link various regional initiatives to share information on pathways, control mechanisms and techniques as well as to co-ordinate research on ecosystem effects.

#### Economic Instruments<sup>114</sup>

Since invasions by alien species are a result of economic activity and have economic impacts, it makes sense to consider applying economic tools to influence or control these activities in tandem with traditional command and control regulatory responses. Economic instruments are often proposed as an alternative to command and control. While this may be the case with some

<sup>112</sup> See New Brunswick regulations under the Aquaculture Act, SNB (1988), CA 9.2, reg. 91–158, OC 91–806, s.11.

<sup>113</sup> Based on personal communications with Larry Hildebrandt, Environment Canada, and Andrew Cameron, Nova Scotia Department of Agriculture and Fisheries, January 2001. State of Massachusetts recently requested that this issue be included in the Council's priorities.

<sup>114</sup> For a general discussion of the use of economic instruments, see C. Shine, N. Williams and L. Gruendling, "A Guide to Designing Legal and Institutional Frameworks on Alien Invasive Species", Environmental Policy and Law Paper No. 40 (IUCN Environmental Law Centre, 2000), p. 83.

economic instruments, it is important to recognise that economic instruments still have to be implemented, and compliance is as important for economic instruments as it is for a technical regulation or a permit.

It is therefore more appropriate to consider economic instruments as alternative or complementary to permits, or technical regulations, rather than alternatives to command and control. Both have to be enforced. The difference is that the focus of the enforcement effort for economic instruments is on the payment of the fee or adherence to the instrument, not on direct compliance with the technical requirement that leads to the reduced risk of invasion. This makes monitoring of the effectiveness of the economic instrument in achieving the environmental objective crucial.

A number of economic instruments have been considered for invasive species regulation.<sup>115</sup> The following instruments have received fairly broad acceptance in the literature on invasive species:

#### *Insurance*

Insurance would be especially suitable for commercial operations. Depending on the circumstances, it can be an effective way to internalise the cost of responding to invasions. It may also encourage private regulation by the insurance industry by utilising the insurer's motivation to reduce its exposure by reducing the risk of introduction of invasive species through activities of its insured. Availability of coverage and limitation of liability are related issues that would need to be addressed.

One limiting factor may be the proof of liability aspect depending on the source. In case of introduction through ballast water or hull fouling, for example, it is unlikely that one particular vessel can be identified as responsible for the introduction. Most likely, a number of vessels releasing large numbers of a species over a period of time will result in that species eventually becoming established. This creates proof of liability challenges. In such cases, it may be more appropriate to set up a no fault insurance system. All users pay into the fund, and the fund pays for the cost of responding to invasions.

The challenge with such an approach is to implement it in such a way as to provide the incentive to minimise the risk where the crucial decisions are made. A liability fund provides such incentives to the industry as a whole, but providing incentives to individual vessel owners and operators may be more difficult. Some of these issues could be addressed through distribution of contributions to the fund, but only if it can be linked to an effective measure of actions taken to prevent invasions.

Insurance requirements are generally easier to design to effectively encourage

<sup>115</sup> For a discussion of application of a selection of market-based instruments to invasive species, including the concept of No Net Gain, taxes, and bounty systems, see Eric Biber, "Exploring Regulatory Options for Controlling the Introduction of Non-indigenous Species to the United States", (1999) 18 *Virginia Environmental Law Journal* 375–465, at 440, 454–460.

responsible behavior and internalise the cost of invasions where the link between the activity and the invasion is easy to establish. An example might be an aquaculture operation, depending on the density and nature of aquaculture operations in a given area. If responsibility for invasion can be established without too much effort, mandatory insurance can essentially result in private regulation of that industry. If designed well, it has the potential to ensure measures are taken to minimise or eliminate the risk of invasions.

#### *Deposits/performance bonds*

Performance bonds can also help internalise costs but they tend to place the financial incentive to reduce the risk more directly on the proponent of the activity that could lead to the introduction. For example, performance bonds could be required of commercial aquaculture permit holders as a guarantee of compliance with conditions regarding alien species kept in containment. They can operate very much like a requirement for mandatory insurance, with the exception that the regulatory process would be more likely to remain in the hand of government officials. One application proposed by the IUCN would involve a deposit paid by purchasers of aquarium specimens. That deposit would be refundable to the consumer, if she made use of the recovery system. Such a system would operate very much like the deposit refund systems for beverage containers, tyres, etc., that many of us are familiar with in the context of waste reduction and recycling.

#### *Taxes/levies*

Taxes and levies can be very effective tools to encourage responsible behaviour, as they can be designed to influence specific decisions, from the import stage to the final consumer. Such charges are most effective at improving decision making, if they target the decision makers most likely to be in a position to prevent the introduction. Possibilities range from levies on shipments to cover the cost of inspections to taxes on sales of alien plants or animals by breeders or traders. The objective of the tax may be simply to internalise the cost of avoiding the invasion, or to discourage operators from making decisions that can increase the risk of invasions or both. The specific design of the tax or levy will depend on the objective, and the decisions to be influenced.

Some states, for example, already impose taxes on shipments and passengers to cover the cost of treatment of waste at ports to comply with MARPOL (1973). Similar taxes could be added to the cost of transporting goods and passengers through any means that carries with it the risk of introducing non-native species. If such a system is to influence the decision of the user of these transportation services, it is essential that there is a choice. The choice could be between two modes of transportation with different levels of risk of invasions. In that case, it will be important that the difference in risk be reflected in differences in the taxes charged. Alternatively, the choice may be between local goods and goods shipped from far away.

The choice of instrument as well as its design very much depends on where

the solutions lie, what decisions are to be influenced. One concern with the use of taxes is that the distribution of the burden of addressing the problem is often less than equitable. A flat tax on goods, for example, will impact lower income earners disproportionately. This is a particular concern when the goods are essential, and the purpose of the tax is to cover the cost of invasions, not to encourage use of an available alternative. Other concerns include tax evasion problems, and the challenge of finding the appropriate level of taxation to either cover the cost of invasion or encourage a change in behaviour.<sup>116</sup>

#### *Fees/charges*

Fees and charges are imposed on applicants for permits to carry out a controlled activity. These charges should be set at a level to recover all direct costs of permit applications. Recovering the hidden cost of use of natural resources could form the basis for imposing charges linked to the amount of such resources consumed.

Fees of this kind are common in many parts of the world. An example would be a charge on water consumption that covers the cost of treating waste water. In many ways fees and charges can operate in a manner similar to taxes and levies. The difference is generally considered to be in what is done with the revenues generated. Taxes, in most countries, contribute to the general revenues of the government that collects them. Fees, on the other hand, are generally collected for a specific purpose. It is therefore more likely that fees collected will be specifically set aside for the purpose of addressing issues related to invasive species.

The application of economic instruments in the context of aquatic invasive species has been very limited. Some state and provincial statutes on aquaculture are sufficiently broad to allow for insurance requirements, performance bonds and fees as part of the permitting process. Similarly, where permitting processes exist for fish bait and fish stocking, the use of such economic instruments is either possible under the current regulatory regime, or could be with minor amendments. Finally, in the context of commercial fishing operations and their potential for introducing invasive species, economic instruments could be incorporated into licensing procedures. From a practical perspective, however, little has been done in this area in North America.

#### **Permitting**

Permitting as a regulatory tool has been widely used by many jurisdictions in Mexico, the US and Canada to permit or disallow intentional introductions and to regulate activities with an inherent risk of introduction. The latter group includes permitting processes for aquaculture, live bait and other fishing practices. Components of a permitting process as set out in the IUCN Guide on

<sup>116</sup> *Ibid.*, p. 440.

Designing Legal and Institutional Frameworks on Alien Invasive Species<sup>117</sup> include the following:

- A clear statement of what species are subject to the permit requirement
- A clear statement of information to be supplied by the applicant
- Public access to information on applications, criteria, hearings and decisions
- Risk analysis and environmental impact assessment, based on scientific principles and evidence
- Provision of objective and technically sound information to guide decision makers in determining permit applications
- Possibility of permit conditions (monitoring, emergency plans and containment procedures)
- Possibility of allocating the cost of the permit process to the applicant
- Sanctions for breach and non-compliance with the permit.

It is clear from this list that the issue of effective permitting is closely linked to a number of tools and principles already discussed. Permitting, if based on a clean list approach,<sup>118</sup> for example, can be used to implement the principles of prevention and precaution. The concept of polluter pays can also become part of the permitting process, by requiring the applicant to bear the application cost, and through conditions for insurance or bonds as discussed under economic instruments. Setting appropriate fee structures and appropriate insurance requirement helps make use of these tools more effective. Finally, the permitting process ties in with ecological risk assessment, in a number of ways. It can be utilised in developing a clean list, to help regulators determine which permits can be granted without condition or further study, which ones should be refused, and which require more study.

## Conclusion

The problem of regulating activities that can lead to the introduction of invasive species is not unique, and many of the tools used to address other environmental issues can be effectively adapted to address the issue of aquatic invasives. Application of a precautionary approach through the use of a clean list approach to aquaculture regulation in combination with a command and control system and the application of economic instruments to fund eradication or control measures if something goes wrong, for example, would seem to be an effective way forward with respect to aquaculture. What is hampering progress, it seems, is not a lack of regulatory options to effectively respond to this challenge, but a lack of agreement on the value we should place on preventing invasions, and a lack of international commitment to move forward together. This results in apprehension to implement measures that are perceived to hamper international

<sup>117</sup> Note 105 above.

<sup>118</sup> Or perhaps a three-list approach, with a clean list, a gray list and a black list, each on an ecosystem basis to take into account special ecosystem conditions and sensitivities.



trade, competitiveness of domestic industries, or are otherwise seen as coming at an economic cost.

This is a particularly interesting dilemma in the context of invasive species, as it seems clear that the cost of not acting will not only be the cost of losing biodiversity and a general threat to nature, which have been historically the most difficult values to include in decision making. In the case of invasives, perhaps more than other environmental challenges, there is a clear risk to industries, a clear link to economic loss resulting from the environmental harm. In the context of aquatics, they include the fishing industry and aquaculture among others. For terrestrial invasives, they also include agriculture and forestry. In case of invasions from international transport, the challenge, unless the risk can be eliminated without eliminating trade, seems to turn into a choice between international trade and domestic industries. It is surprising, in this context, that the issue has not received more public attention. It is also surprising that the pressure to respond to this challenge has not been greater.

Co-ordination and co-operation is key to effective regional control of invasives. Much of the experience to date in North America has been with bilateral co-ordination. The British Columbia/ Washington example demonstrates co-ordination in response to a specific pathway. Opportunities to expand these co-ordination efforts into such areas as research, information sharing and public outreach should be explored as important elements for developing an effective response to aquatic invasive species problems.

While certain co-operative initiatives exist, there is potential for greater co-operation and co-ordination. Agreement among the North American countries on regional priorities to address the aquatic invasive species problem would be a useful first step. Such a framework could provide a foundation on which to build co-operation and co-ordination in such areas as research, information exchange, education, prevention and controlling all as part of an effort to address the threat of aquatic invasive species.

What is interesting in following the development of law and policy responses to invasive species is that there is a recognition that it is next to impossible to eradicate once an invasive species has established itself. Furthermore, it is also generally recognised that for many of the sources of introduction, including ballast water, hull fouling and aquaculture, the measures proposed to date will reduce the risk, not eliminate it. This may buy us some more time, in that it will result in less invasions in a given time frame, but it would seem that the long-term prognosis is still the same, we are creating a global species melting pot, where invasive species will inevitable out-compete a number of native species and result in further extinctions. This will only change, if the risk of invasions can be eliminated. Whether it is realistic to eliminate the risk without eliminating the activities is the long-term question. In the meantime, this review of existing law and policy responses demonstrates that much can be accomplished with existing methods to reduce the risk.

In the end, what is needed in the North American context to even significantly

reduce the risk of invasions is a regional approach based on a long-term assessment of the costs of allowing invasives to continue to take hold, and a long-term assessment on the benefits of permitting the activities that result in these invasions. Beyond this, the threat of invasions from international trade in goods raises the more general question of the long-term costs and benefits of international trade in goods. It would be worth considering whether there are alternatives in light of the growing number of challenges associated with the international trade of goods, such as the climate change and air pollution impacts from transportation, the growing inequity between north and south, and the unsustainable consumption of our resources in an effort to produce goods for international trade.

In this context, the invasives problem is yet another indication of the fundamental changes that inevitable result from a combination of population growth and per capita increase in consumption of resources over the past half century. It remains to be seen whether this symptom will be treated, whether it will be treated effectively, and whether it will serve to bring attention to the underlying causes. For now, it can only be concluded that the law and policy options to reduce the risk are fairly well developed, what is missing to date is a consensus on which options to pursue, and a commitment to implement effective measures, either internationally, regionally or within individual countries. In the meantime, the invasion continues.

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